Minimize pesticide resistance development
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Repeated applications of the same mode of action pesticides will increase the likelihood of pesticide resistance. Many of today's pesticides are more elegant than products from several decades ago. Instead of targeting several aspects of a target pest's biochemistry or physiology, many newer products impact a very specific process that either kills or slows the growth of a pest. This generally increases the specificity of an active ingredient for the target pest and increases the safety for non-target organisms.

Pesticide resistance occurs when an individual pest organism develops a change or mutation that allows it to tolerate a pest control product. In most cases, resistance development is a continuum of tolerance where the more tolerant strain of a pest has an advantage over less tolerant pests. Through reproduction, resistance genes can spread to a pest's offspring and a resistant population can develop. Sometimes pests can develop rapid or complete tolerance to an active ingredient. For example, the dollar spot pathogen can develop complete resistance to the active ingredient thiophanate-methyl with only one small genetic change.

There are international boards of expert scientists that group different insect, weed and disease control ingredients (insecticides, herbicides and fungicides) into different groups or classes (IRAC, HRAC, FRAC). Ingredients in these different classes have very similar modes or mechanism of action. This allows pests to develop resistance in similar ways. When applying pesticides, it is important to know products group/class to avoid applying the same type of control product repeatedly. Many pesticide manufactures are now putting these group/class numbers on the front of their product label (Fig 1). Herbicides and Insecticides have similar, but not identical, classification schemes.

Figure 1. Screenshots of the top of three fungicide labels listing the FRAC group on the top-right. All three products contain a DMI fungicide (Group 3).

Following label directions is the first step in minimizing pesticide resistance. Using an ingredient incorrectly can diminish effective control and promote survival of more tolerant organisms. Be sure to read product labels thoroughly before making an application to identify the resistance group, use the appropriate rate& timing, and understand other factors that could impact performance and safety of a pesticide.

A very strategic means of reducing the risk of resistance is to minimize the number of applications for a target pest. The more times an ingredient from a particular resistance group/class is applied increases the risk of resistance development. Different pest models exist to help avoid unnecessary applications (i.e. Smith-Kerns dollar spot model, grassy weed emergence models, annual bluegrass weevil models).

Rotating pesticide mode (or mechanism) of action when making repeated applications is an effective strategy for a pest. For example, a dollar spot control program might have ingredients from FRAC groups 3, 7 and 11. Mixing multiple ingredients from different groups during an application can also reduce the risk of resistance, as long as all the active ingredients in the mixture control the pest of concern. The pest population would need to evolve resistance of two or more mechanisms of action at the same time to increase the potential for pesticide resistance, a very rare possibility.

Some ingredients that work at multiple locations (sites) in a pest. These "multi-site" materials have a much lower risk of resistance. A well-known example is the fungicide chlorothalonil (FRAC Group M5). It has very low risk of resistance development but may also impact other non-target organisms. There has also been increased regulatory pressure to restrict or remove some of these multi-site products from use in turfgrass systems. Turfgrass managers will need to rely on other chemistries to fill these gaps.

Resistance management for turfgrass pests is a real concern. There are strategies to minimize and slow this risk. It's important to know a product's active ingredients – and their resistance groups or classes – to stay ahead of this problem. Finally, there are tools out there that can help managers select appropriate products including the Turfgrass Weed Control for Professionals, Chemical Control of Turf Diseases, Application Advisor in UNL's GreenKeeper App, Tennessee's Mobile Weed Manual, and UW's new Turf Pest Management Mobile app. Many of these resources also include resistance groups/classes for the different active ingredients. With the correct information and thoughtful product selection, you can minimize the risk of pesticide resistance at your facility.

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